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WINTER WATER TEMPERATURES AND AN ANNOTATED LIST OF FISHES-- NANTUCKET SHOALS TO CAPE HATTERAS Albatross III CRUISE NO. 126

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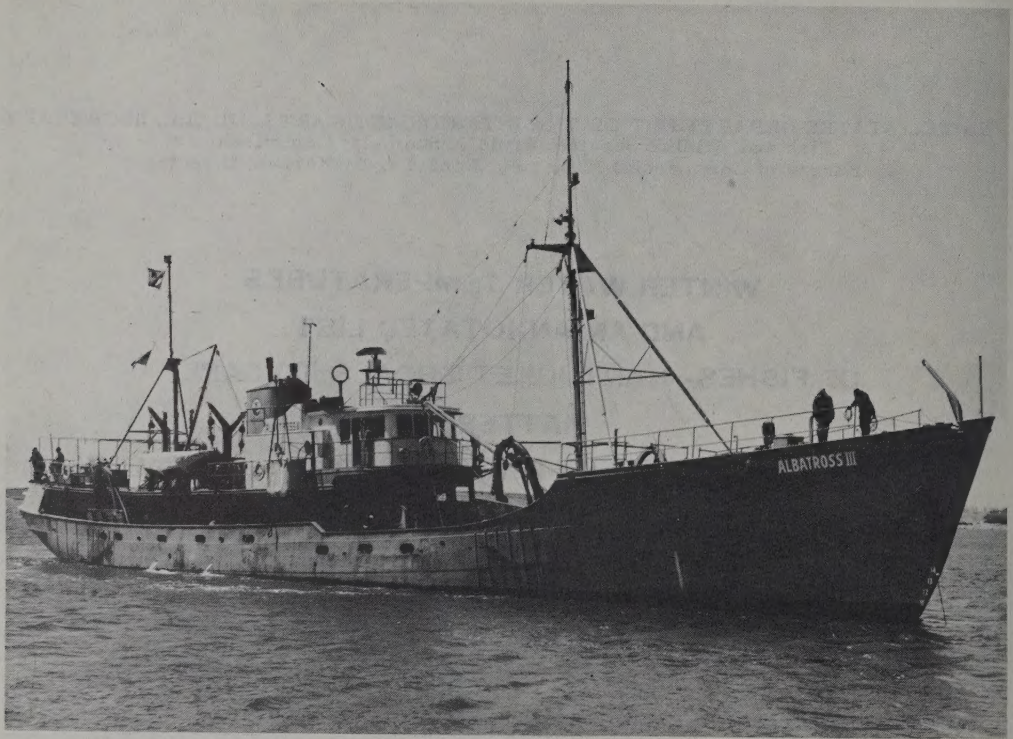

M/V Albatross III

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Cruise no. 126 of the *Albatross III* was planned and conducted to gather information about the distribution of fishes across the Continental Shelf from Nantucket Shoals to Cape Hatteras during the late winter period when water temperatures generally are at their minimum. The shelf here has a general hydrographic similarity from north to south, well described by Bigelow (1933), that makes it a particularly worthwhile area in which to study the relation of fish distribution to water temperature, depth, and other factors of the environment. Since the fish of this portion of the shelf support several different, relatively important food and industrial fisheries, as well as an intensive marine sport fishery, Cruise no. 126 served to provide data valuable to several research programs.

This area has a distinctive fauna attributed in part to the thermal barrier present across the shelf at Cape Hatteras, as well as another such barrier, less marked, separating the waters of southern New England and the Gulf of Maine. No one species of marine fish is necessarily restricted to the shelf of the Middle Atlantic. However, several species of commercial importance are present here, and only here, in significant numbers. Among these are the scup, fluke, common sea robin, tilefish, sea bass, and tautog.

To the north, this area shares a number of species with the Gulf of Maine, especially during the winter months. Some of these are the yellowtail flounder, white hake, long-horned sculpin, eelpout, and winter flounder. Species entering from the south, especially during the periods of warmest water on the shelf, include some that habitually range even further south than Florida. Among these species are the bluefish, bluefin tuna, swordfish, American hake[1], filefish (several species), smooth dogfish, weakfish, and kingfish.

The *Albatross III* sailed from Woods Hole on January 21, 1959, and returned on February 3. This was, as it turned out, the last biological research cruise of the *Albatross III*. During this cruise a total of eight fishing transects, totaling 53 fishing stations, were made across the shelf as indicated in figure 1. One hundred and eighty-three bathythermograph casts were made, the positions for which, with associated sea and weather data, are given in Appendix I.

When time permitted, an effort was made to evaluate the ability of the Edo AN/UQN-1B echo sounder to differentiate various species of fish.

GEAR AND OPERATIONS

A standard No. 36 otter trawl was used throughout, with the cod end and upper belly lined with 1/2-inch (stretched measure) cotton mesh to retain small fish. All of the tows were one-half hour each. The standard survey record card of the Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, was used to record the data. All fish were counted and measured (fork length, to the nearest millimeter) except in those few cases where the numbers were excessive, at which time aliquots

Note.--Robert L. Edwards and Robert Livingstone, Jr., *Fishery Research Biologists*, U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Massachusetts; and Paul E. Hamer, *Fisheries Biologist*, Department of Conservation and Economic Development, Trenton, New Jersey.

[1] We prefer the vernacular name, "American hake," for *Merluccius albidus*, to call to mind its relation to the European hake, *M. merluccius* L., and to set it apart from other common deepwater hakes.

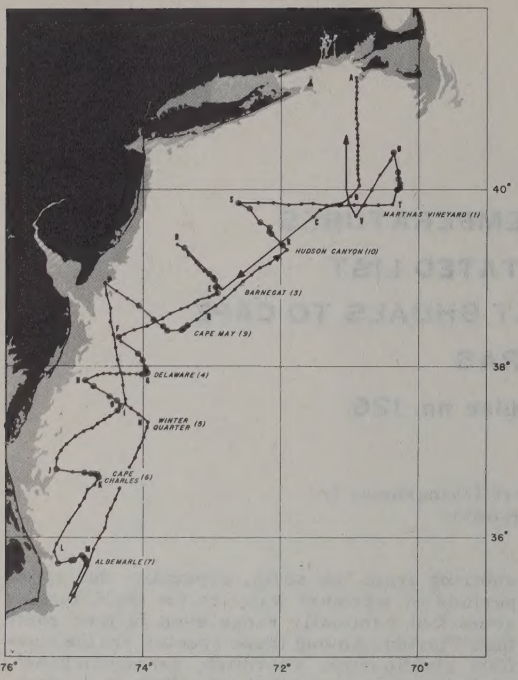

Figure 1.--Cruise track of *Albatross III* Cruise no. 126. Solid circles indicate BT drops and ringed circles indicate fishing stations. Each fishing transect is identified with its code number and name. Letters are used to indicate beginnings and endings of various profiles presented in Appendix II.

were sampled. All skates and sharks were measured (total length) and sexed. Samples of fish and invertebrates for laboratory studies were preserved. All fish that could not be precisely identified on board ship were preserved for determination in the laboratory.

FISHING TRANSECTS

Each fishing transect was planned to be completed in the daylight hours of 1 day. Bad weather interfered only once after a transect had been started. The very last transect (off Block Island) was not attempted because of foul weather. The general plan was to make seven stations on each transect, at 20, 40, 60, 80, 100, 150, and 200 fathoms. These depths were not considered rigid, however, and the stations were spaced so that each transect would include stations representative both of the extremes in depth and the extremes in temperature. Where the shelf was widest, New Jersey northward, the transects could not be extended into the shallower water because of the great amount of running time necessary to get from station to station. To the south, however, seven stations were easily completed within a day. The fishing station data are listed in table 1.

HYDROGRAPHIC TRANSECTS

Hydrographic work was limited to surface temperatures and to bathythermograph (BT) casts. The BT was used at the end of each fishing station and at regular intervals, usually every hour and occasionally every half hour. The bathythermographs were regularly checked against the surface thermometers, and the temperature unit was calibrated once aboard ship. The BT temperature data appeared to be reliable to within $\pm 0.3^{\circ}$ F. The temperature data were plotted daily, both to help the planning of the following day's work and to keep a check on the functioning of the bathythermographs.

SURFACE TEMPERATURES

Surface temperatures obtained on this cruise for this section of the Atlantic coast were different only in detail from temperatures reported by Bigelow (1933) for this time of year (fig. 3). Along the coast, surface temperatures were in the low 40's to the south and in the upper 30's off southern New England. Previous survey cruises off southern New England, especially *Albatross III* Cruise no. 86, January 22, 1957, found considerably colder surface water (middle 30's) further offshore than we observed on this trip. Around Cape Hatteras, the immediate influence of the Gulf Stream may be observed, dwindling to the northward.

BOTTOM TEMPERATURES

Bottom water temperatures observed on this cruise (fig. 4) correspond in general with those reported by Bigelow for this time of the year. Typically, there is a band of warmer water on the bottom along the outer edge of the Continental Shelf, as shown in figure 4 and in various transects (Appendix II). Bottom temperatures are colder both inshore and offshore of this band, as one would anticipate.

TEMPERATURE PROFILES

Temperature profiles (Appendix II, figs. A-1 to A-18) are presented for each bathythermograph transect. Even allowing for the $\pm 0.3^{\circ}$F. variation in the BT recordings, there is a remarkably consistent pattern of temperature distribution across the shelf. This pattern includes a marked temperature inversion over much of the shelf in depths over 40 fathoms out to about the 100-fathom line. Moving from south to north, the warmer water becomes more and more restricted, and occasionally, as off the Hudson Canyon, is off the bottom (see fig. A-4). Whether or not such a warm water zone is also to be found during the winter off Georges Bank further to the north remains to be established.

Examination of these profiles along with the comparable sections illustrated in Bigelow (1933) show differences in detail worthy of

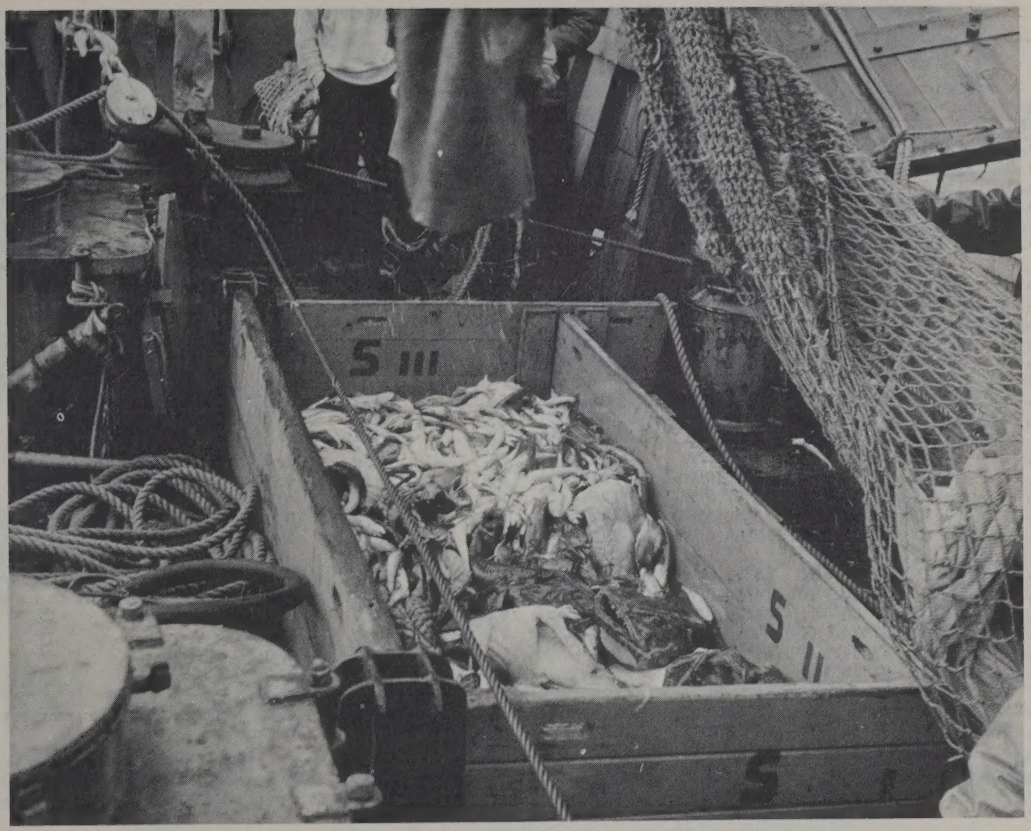

Figure 2.--A typical deep tow, station 4-8.

comment. All our profiles show generally warmer conditions than illustrated by Bigelow for the years 1929, 1930, and 1931. In addition the inversion is more pronounced in our 1959 data.

ANNOTATED LIST OF SPECIES

In the following list, the collection data are presented for those species not listed in Appendix II, appendix tables 2-9. The stations and appropriate data are listed in table 1. As previously mentioned, all fish, or aliquots from each tow, were measured. Only those measurements are given in this list that the authors believe worthy of record at this time.

Hagfishes

Hagfish, *Myxine glutinosa* Linnaeus. Sta. 4-8, 1; and 9-6, 1 specimen.

Sharks

Chain dogfish, *Scyliorhinus retifer* (Garman). Sta. 3-3, 1; 4-4, 1; 4-7, 1; 5-7, 2; 6-4, 1; 6-5, 1; 6-6, 1; 9-4, 1; and 9-5, 1 specimen.

Smooth dogfish, *Mustelus canis* (Mitchill). Sta. 7-1, 20; 7-3, 1; and 7-4, 1 specimen.

Spiny dogfish, *Squalus acanthias* Linnaeus. Collection data listed on fishing transect profiles. The results of this cruise indicate that spiny dogfish tend to school by sex and that the males are usually found in cooler water than the females (fig. 5).

Etmopterus, *Etmopterus hillianus* (Poey). Sta. 7-6, 2 specimens.

Angel shark, *Squatina dumeril* (Lesueur). Sta. 5-7, 1; 7-4, 7; 7-6, 2; and 9-1, 1 specimen.

Skates and Torpedoes

Torpedo, *Torpedo nobiliana* Bonaparte. Sta. 10-5, 1 specimen.

Barndoor skate, *Raja laevis* Mitchill. Collection data listed on fishing transect profiles.

Big skate, *Raja ocellata* Mitchill. Collection data listed on fishing transect profiles.

Brier skate, *Raja eglanteria* Bosc. Collection data listed on fishing transect profiles.

Table 1.--List of fishing stations and pertinent data

Date 1959	Station number	Position Latitude	Position Longitude	Average depth of tow in feet	BT slide number	Bottom temperature (°F.)	Speed over bottom (knots)	Remarks
Feb. 3	1 - 1	39°58.8'N	70°19.0'W	210	172	1/ ±44	4.4	Martha's Vineyard transect
Feb. 3	1 - 2	40°00.5'N	70°17.0'W	146	173	2/ 49	3.8	
Feb. 3	1 - 3	40°03.2'N	70°13.5'W	99	174	1/ ±50	3.4	
Feb. 3	1 - 4	40°06.0'N	70°14.5'W	83	175	2/ 52	3.6	
Feb. 3	1 - 5	40°09.5'N	70°17.0'W	64	176	2/ 55	3.6	
Feb. 3	1 - 6	40°22.0'N	70°20.3'W	47	177	2/ 48	4.4	
Jan. 23	3 - 1	39°24.0'N	73°29.0'W	25	36	45.7	3.6	Barnegat transect
Jan. 23	3 - 2	39°04.1'N	73°05.0'W	45	37	51.3	5.2	
Jan. 23	3 - 3	38°56.0'N	72°53.3'W	62	39	51.7	4.4	
Jan. 23	3 - 4	38°55.7'N	73°56.5'W	80	40	48.8	3.8	
Jan. 23	3 - 5	38°51.5'N	72°55.5'W	159	41	48.8	4.0	
Jan. 24	4 - 1	38°18.5'N	74°19.3'W	20	54	48.7	5.0	Delaware transect
Jan. 24	4 - 2	38°09.9'N	74°07.0'W	42	55	52.5	5.0	
Jan. 24	4 - 3	38°05.5'N	74°01.5'W	62	56	53.4	4.0	
Jan. 24	4 - 4	38°01.5'N	73°56.0'W	82	57	52.8	4.2	
Jan. 24	4 - 5	37°58.5'N	73°56.0'W	104	58	52.0	4.6	
Jan. 24	4 - 6	37°56.8'N	73°57.5'W	129	59	50.3	4.6	
Jan. 24	4 - 7	37°55.0'N	73°58.5'W	147	60	46.7	5.0	
Jan. 24	4 - 8	37°57.0'N	73°56.0'W	220	61	1/ ±46.0	5.0	
Jan. 25	5 - 1	37°50.6'N	73°52.5'W	18	69	51.7	5.0	Winter quarter transect
Jan. 25	5 - 2	37°40.7'N	74°30.0'W	37	71	55.3	5.4	(interrupted by bad weather)
Jan. 25	5 - 3	37°38.0'N	74°24.0'W	48	72	53.4	5.2	
Jan. 25	5 - 4	37°34.5'N	74°18.5'W	130	73	49.2	3.2	
Jan. 31	5 - 6	37°34.5'N	74°16.0'W	238	124	1/ ±46.5	4.0	
Jan. 31	5 - 7	37°36.5'N	74°16.5'W	92	125	49.0	4.0	
Jan. 25	6 - 1	36°50.0'N	75°13.0'W	17	84	48.1	4.0	Cape Charles transect
Jan. 25	6 - 2	36°46.5'N	74°52.2'W	24	86	55.7	3.2	
Jan. 25	6 - 3	36°45.5'N	74°41.5'W	42	87	54.1	3.2	
Jan. 25	6 - 4	36°45.5'N	74°40.0'W	77	88	49.7	4.4	
Jan. 25	6 - 5	36°48.0'N	74°39.0'W	107	89	52.2	3.6	
Jan. 25	6 - 6	36°46.5'N	74°38.0'W	173	90	46.2	4.0	
Jan. 27	7 - 1	35°48.5'N	74°17.3'W	19	98	59.2	5.0	Albemarle transect
Jan. 27	7 - 2	35°46.5'N	75°03.0'W	26	99-100	59.4	4.4	
Jan. 27	7 - 3	35°46.5'N	74°54.0'W	45	101-102	56.9	3.7	
Jan. 27	7 - 4	35°49.8'N	74°51.6'W	64	103	55.1	--	
Jan. 27	7 - 5	35°47.0'N	74°51.5'W	80	104	53.2	4.6	
Jan. 27	7 - 6	35°45.0'N	74°50.3'W	192	105	50	4.4	
Feb. 1	9 - 1	38°31.6'N	73°53.0'W	31	138	48	3.0	Cape May transect
Feb. 1	9 - 2	38°28.0'N	73°40.0'W	43	139	52.3	3.0	
Feb. 1	9 - 3	38°25.6'N	73°36.4'W	62	140	52.8	4.0	
Feb. 1	9 - 4	38°23.7'N	73°27.2'W	86	141	52.1	3.6	
Feb. 1	9 - 5	38°24.2'N	73°24.7'W	118	142	52.0	3.4	
Feb. 1	9 - 6	38°25.4'N	73°23.2'W	192	143	45.2	4.0	
Feb. 1	9 - 7	38°33.2'N	73°14.0'W	152	144	48	3.6	
Feb. 2	10 - 1	39°29.4'N	72°06.2'W	228	--	1/ ±42	4.6	Hudson Canyon transect
Feb. 2	10 - 2	39°31.3'N	72°06.0'W	178	155	44.5	4.0	
Feb. 2	10 - 3	39°31.0'N	72°10.7'W	103	156	49.3	3.6	
Feb. 2	10 - 4	39°32.2'N	72°09.3'W	92	157	51.0	3.8	
Feb. 2	10 - 5	39°37.0'N	72°16.0'W	67	158	52.0	5.0	
Feb. 2	10 - 6	39°46.0'N	72°25.0'W	46	159	47.8	4.0	
Feb. 2	10 - 7	39°49.0'N	72°38.2'W	32	160	44.1	4.4	

1/ Bottom temperatures for depths greater than 150 fathoms estimated by extropolating bathythermograph data.

2/ Data considered reliable to nearest degree only.

Figure 3.--Surface temperatures in degrees Fahrenheit on the Continental Shelf, Nantucket Shoals to Cape Hatteras. Based on data collected January 23 to February 3, 1959.

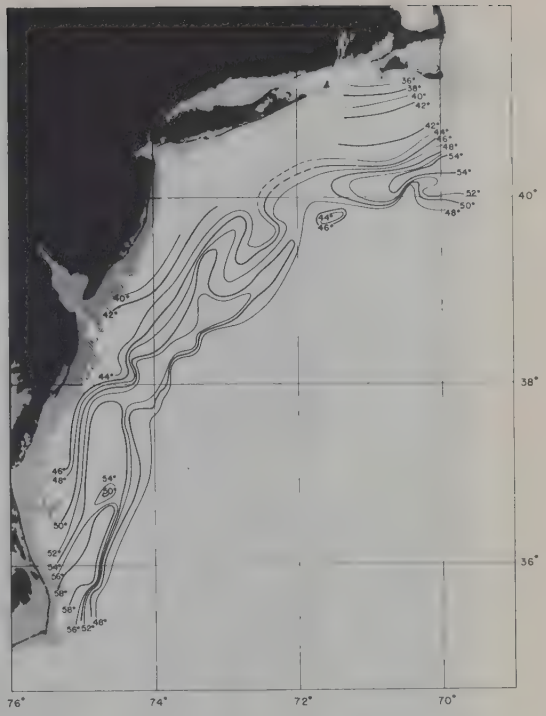

Figure 4.--Bottom temperatures in degrees Fahrenheit on the Continental Shelf, Nantucket Shoals to Cape Hatteras. Based on data collected January 23 to February 3, 1959.

Leopard skate, *Raja garmani* Whitley. Collection data listed on fishing transect profiles.

Little skate, *Raja erinacea* Mitchill. Sta. 1-1, 3; 9-1, 3; 9-3, 1; 10-6, 1; and 10-7, 2 specimens.

Smooth-tailed skate, *Raja senta* Garman. Sta. 10-1, 1 specimen.

Thorny skate, *Raja radiata* Donovan. Sta. 1-1, 1; and 10-1, 3 specimens.

Lantern Fishes and other "Deep-Sea Fishes"

Headlight fish, *Diaphus dumerilii* (Bleeker). Sta. 4-5, over 300 specimens averaging 75 mm. in length; sta. 7-6, 16; and 10-2, 1 specimen. The lower lobe of the caudal is black, facilitating separation of this species in the field.

Madeira lantern fish, *Lampanyctus maderensis* (Lowe). Sta. 3-5, 1; and 7-6, 1 specimen. This species has the upper lobe of the caudal tipped with black.

Humboldt's lantern fish, *Myctophum humboldti* (Risso). Sta. 1-1, 1 specimen plus 2 others, almost certainly this species, that were apparently regurgitated by another fish. The latter specimens were each about 160 mm. in length.

Pearlsides, *Maurolicus pennanti* (Walbaum). Sta. 4-5, 1 specimen.

Gonostoma, *Gonostoma elongatum* Gunther. Sta. 10-1, 3; and 10-2, 2 specimens. These and many other specimens from stomachs, presumably the same species averaged about 170 mm. in length.

Hatchet fish, *Polyipnus asteroides* Schultz. Sta. 5-6, 1 specimen about 55 mm. in length.

Paralepis, *Paralepis* sp. Sta. 7-6, 1 specimen. This appears to be an undescribed species.

Sorcerer, genus *Venefica*. Sta. 10-2, 1 specimen. Several examples, probably this genus as well, varying from 300 to 500 mm. were also taken from the stomachs of white hake on this station. The specimen listed was taken alive. It had been injured earlier in life and had lost perhaps one-third of its tail.

Green-eye, *Chloropthalmus agassizii* Bonaparte. Sta. 1-1, 8; 1-2, 1; 4-8, 12; 5-6, 5; 9-6, 1; and 10-2, 4 specimens. This determination should be considered tentative until present efforts at revision of this genus are completed.

Benthodesmus, *Benthodesmus atlanticus* Goode and Bean. Sta. 1-1, 1 specimen.

Figure 5.--A big haul of spiny dogfish, station 9-3.

Hypsicometes. *Hypsicometes gobioides* Goode. Sta. 10-2, 1; and 10-3, 1 specimen.

Hypoclydonia, *Hypoclydonia bella* (Goode and Bean). Sta. 5-6, 1; and 4-5, 3 specimens.

Lowe's polymixia, *Polymixia lowei* Gunther. Sta. 4-7, 1; and 6-5, 2 specimens.

Herrings

Round herring, *Etrumeus sadina* (Mitchill). Sta. 6-3, 600+; 7-2, 8; and 7-4, 500+. See figure 6 and remarks under bluefin tuna.

Herring, *Clupea harengus* Linnaeus. Sta. 10-5, 11 specimens.

Alewife, *Pomolobus pseudoharengus* (Nilson). Sta. 1-6, 4; and 10-6, 5 specimens.

Blueback, *Pomolobus aestivalis* (Mitchill). Sta. 4-2, 1 specimen.

Shad, *Alosa sapidissima* (Wilson). Sta. 4-3, 1; and 5-7, 2 specimens.

Hakes

Silver hake, *Merluccius bilinearis* (Mitchill). Collection data listed on fishing transect profiles.

American hake, *Merluccius albidus* (Mitchill). Collection data listed on fishing transect profiles. This fish has been called the "offshore" hake by Bigelow and Schroeder (1955). It appears to be very closely related to another *Merluccius* species in the eastern Atlantic called the European hake (*M. merluccius*). Since there are already many species of hakes in our offshore waters, we feel that American hake is to be preferred as a vernacular name.

If our interpretation of the echo sounder traces is correct, both this species and *M. bilinearis* must be very common in the offshore middle Atlantic

Figure 6.--Counting and measuring *Etrumeus*, station 7-4.

area. Several fishermen aboard the *Albatross III* during this cruise expressed the opinion that a dragger might very well catch these two whitings in commercial quantities, especially along that section of the shelf edge south of Hudson Canyon. There is no doubt that both species appear to be quite abundant between 100 and 250 fathoms.

White hake, *Urophycis tenuis* (Mitchill). Collection data listed on fishing transect profiles. The white hake taken late in afternoon invariably had eaten recently. Their food included squid, octopi, and several species of deep-sea fishes. The females had enlarged ovaries, which appeared to be ripening.

Red hake, *Urophycis chuss* (Walbaum). Collection data listed on fishing transect profiles. It was hoped that we might be able to define the winter habitat of the red hake during this cruise. This fish is abundant inshore during the summer months, where, in the New England area, it has supported the industrial fishery. We did not catch them at any time in such numbers that we felt we had located the winter center of abundance.

This species appeared to be most abundant in depths between 100 and 250 fathoms where the water temperature was between 47° and 50° F. During the summer months, also, red hake are most abundant in water having a temperature of about 48° F. Fishing transects made on other cruises during the winter months have demonstrated that red hake may be as abundant on the inshore side of the warm water at the shelf edge as on the offshore side. It is possible that this fish is not fully available to an otter trawl at this time; that is, the species may be a considerable distance off the bottom or widely spread out and not as concentrated as it is when inshore in the summer. In any event, it does appear that this fish prefers a year-round water temperature slightly less than 50° F.

Spotted hake, *Urophycis regius* (Walbaum). Collection data listed on fishing transect profiles.

Long-finned hake, *Urophycis chesteri* (Goode and Bean). Collection data listed on fishing transect profiles. Five larvae from sta. 5-6.

Hakeling, *Physiculus fulvus* (Bean). Sta. 1-1, 1; and 10-1, 1 specimen. Both specimens were

alive when brought up. They were generally a very dark brownish black above and on the sides and an intense bluish black ventrally, especially about the area beneath which lies the abdominal cavity.

The drawing in Bigelow and Schroeder (1953) does not adequately convey the true profile of this fish. Mr. Frank Bailey kindly prepared figure 7, illustrating this species, from our material.

Four-bearded rockling, *Enchyelyopus cimbrius* (Linnaeus). Sta. 5-6, 1; and 7-5, 1 specimen.

Grenadiers

Three species of grenadiers were collected. The nomenclature used is that of Parr (1946).

Malacocephalus (Pawnurus) occidentalis, Goode and Bean. Sta. 6-5, 2 specimens, 221 and 255 mm. in length; and sta. 9-6, 1 specimen, a mature female, 372 mm. in length.

Nezumia bairdii (Goode and Bean). Sta. 1-1, 3 specimens; sta. 10-1, 12 specimens varying from 230 to 332 mm. in length; and sta. 10-2, 8 specimens, 6 of which were from 220 to 283 mm. in length with two very small specimens measuring 70 and 130 mm. in length.

Coelorhynchus carminatus (Goode). Sta. 1-1, 3 specimens, 242, 261 and 267 mm.; sta. 1-2, 2 specimens, 215 and 295 mm.; sta. 3-5, 2 specimens, 222 and 231 mm.; sta. 4-8, 6 specimens, varying from 170 to 250 mm. in length; sta. 5-6, 9, not measured; sta. 6-6, 3 specimens, 230, 248, and 272 mm.; sta. 9-6, 4 specimens varying in length from 219 to 272 mm.; sta. 10-1, 2 specimens, 200 and 256 mm.; and sta. 10-2, 6 specimens, 5 of which were from 205 to 248 mm. in length and one (tail broken) about 330 mm.

C. carminatus was obviously relatively common through the area, perhaps more abundant to the south, at least in the depths fished. *N. bairdii* was collected only north of the 39th parallel. Both *Nezumia* and *Coelorhynchus* were collected in greatest number in the deeper water.

The length frequency data indicates that we had sampled three age classes. There was little on the scales, however, to indicate that it might be possible to age specimens of *Nezumia* or *Coelorhynchus*. Specimens of *Coelorhynchus* and *Nezumia* over 300 mm. appeared to be clearly approaching maturity, leading us to believe that these specimens were one year older than the majority, which averaged about 250 mm. *(Coelorhynchus)* and 270 mm. *(Nezumia)*. The two small specimens of *Nezumia* collected, 70 and 130 mm., strongly suggest that we had collected the first three consecutive age classes, depending upon when these fish spawn. If so, the growth rate would not be greatly different from that of the common species of hakes in the area.

The stomachs of most of the specimens were examined, and most were empty. The very few with food all contained crustaceans, predominately amphipods.

Flounders

Fluke, *Paralichthys dentatus* (Linnaeus). Collection data listed on fishing transect profiles.

Four-spot flounder, *Paralichthys oblongus* (Mitchill). Collection data listed on fishing transect profiles.

Grey sole, *Glyptocephalus cynoglossus* (Linnaeus). Collection data listed on fishing transect profiles.

Sand flounder, *Lophosetta maculata* (Mitchill). Sta. 4-1, 1; 5-1, 1; 6-1, 4; and 7-1, 1 specimen.

Gulf Stream flounder, *Citharichthys arctifrons* Goode. Sta. 4-4, 1; 4-6, 1; and 4-7, 1 specimen.

"Deepwater flounder", *Monolene sessilicauda* Goode. Sta. 1-3, 1; and 10-3, 1 specimen.

John Dories

John Dory, *Zenopsis ocellata* (Storer). Sta. 5-4, 1 specimen 428 mm. in total length; and sta. 9-4,

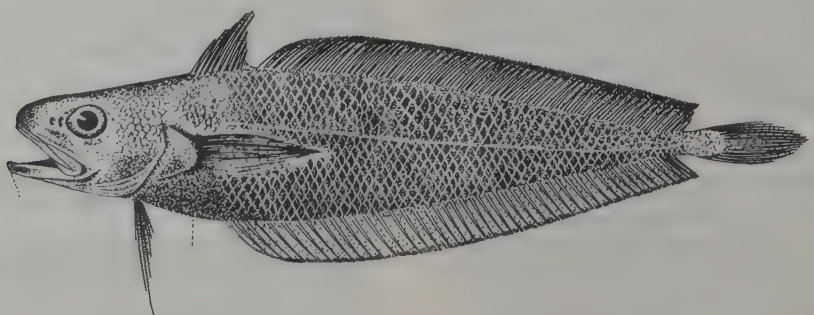

Figure 7.--*Physiculus fulvus* (Bean). Drawn from 160-mm. specimen.

1 specimen of 230 mm. Also 2 specimens not measured, sta. 6-5, 1 and 6-6, 1.

Snipefishes

Snipefish, *Macrorhamphosus scolopax* (Linnaeus). Material tentatively referred to this species. Sta. 4-4, 2; and 10-5, 1 specimen.

Mackerels

Mackerel, *Scomber scombrus* Linnaeus. Sta. 3-1, 1; 3-2, 12; and 3-3, 2 specimens. All specimens were ca. 20 cm. in total length. These stations are on the inshore end of the Barnegat fishing transect. All of these specimens had a well developed "adipose eyelid."

Bluefin tuna, *Thunnus thynnus* (Linnaeus). Sta. 7-4, 13 specimens taken by hook and line, ranging from 43 to 49 cm. in fork length. Figure 8 is a photograph of a 45-cm. specimen. Frank Mather (Woods Hole Oceanographic Institution) kindly verified our identification.

These fish were observed on stations before and after 7-4. They came alongside on this particular station when we have several bushels of round herring in the cod end and a fair number escaping through the 1/2-inch cod end liner. This "chum" attracted the school of small tuna, estimated to contain at least 300 fish. The tuna bit readily on hooks baited with round herring and also avidly struck a yellow-feathered spoon.

Butterfishes

Butterfish, *Poronotus triacanthus* (Peck). Collection data listed on fishing transect profiles.

Bluefishes

Bluefish, *Pomatomus saltatrix* (Linnaeus). Sta. 7-1, 2 specimens (fig. 9).

Sea Basses

Sea bass, *Centropristes striatus* (Linnaeus). Collection data listed on fishing transect profiles.

Porgies

Scup, *Stenotomus versicolor* (Mitchill). Collection data listed on fishing transect profiles.

There were virtually no young-of-the-year scup in our collections. In the opinion of many of the fishery biologists, State and Federal, that had an interest in or occasion to observe the scup last summer (1958), the spawning, or the results thereof, had been an almost total failure. The results of our cruise bear this out.

Of further interest was the fact that the scup taken off New Jersey presented a different appearance to the eye than did those taken to the north and east. Some preliminary observations by two of us, Edwards and Hamer, had led us to believe that differences existed in the stocks that occurred off the coasts of New Jersey and southern New England during the summer months, at least, on the basis of a comparison of scales. The differences observed on this cruise were matters of differences in color. The fish taken north of the Hudson Canyon were darker and generally less colorful than those taken farther south. This color difference was particularly noticeable on the caudal fin. The fish taken off New Jersey had caudal fins that were, by comparison, brightly barred with alternate vertical bands of orange and blue.

Tilefishes

Tilefish, *Lopholatilus chamaeleonticeps* Goode and Bean. Sta. 1-4, 1 specimen.

Rockfishes

Black-bellied redfish, *Halicolenus dactylopterus* (De La Roche). Collection data listed on fishing transect profiles.

Sculpins

Long-horned sculpin, *Myoxocephalus octodecimspinosus* (Mitchill). Sta. 3-2, 1 specimen.

Sea Robins

Common sea robin, *Prionotus carolinus* (Linnaeus). Collection data listed on fishing transect profiles.

Striped sea robin, *Prionotus evolans* (Linnaeus). Sta. 6-5, 1; 7-1, 13; and 7-2, 4 specimens.

Armored sea robin, *Peristedion miniatum* Goode. Collection data listed on fishing transect profiles.

Ocean Pouts

Eelpout, *Macrozoarces americanus* (Block and Schneider). Sta. 1-5, 5; 9-1, 2; and 10-5, 1 specimen.

Anglers

Angler, *Lophius americanus* Cuvier and Valenciennes. Collection data listed on fishing transect profiles.

Frogfishes

Dibranchus atlanticus Peters. Sta. 1-1, 1; 10-1, 3; and 10-2, 2 specimens. It was noticed that pupils of these specimens were black with very slight blue cast, whereas several specimens taken in approximately 200 fathoms southeast of Cape Hatteras had strikingly bright blue pupils.

Figure 8.--A 45-cm. bluefin tuna, photographed immediately after capture.

Figure 9.--Bluefish taken in the trawl on station 7-1.

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Appendix Table 1. --Basic data for bathythermograph casts (data coded where necessary in accordance with H.O. Pub. No. 607--Instruction manual for oceanographic observations), *Albatross III* Cruise no. 126, + 5 time zone

January 1959

Consec. slide no.	Greenwich mean time hour	date	Lat. N.	Long. W.	Depth fm.	Sea surf. temp. °F.	Wind dir.	Wind kn.	Dry bulb temp. °F.	Bar. mb.	Weather	Clouds type	Clouds amt.	Vis.	Swell sea	Swell dir.	Swell amt.
1	0800	21	41 13	70 53	13	37.1	20	18	44.0	12	02	7	8	5	3	25	2
2	0830	21	41 10	70 53	16	39.0	20	18	45.0	12	02	6	8	7	4	25	2
3	0900	21	41 07	70 53	19	37.1	23	20	45.0	12	01	4	7	7	4	25	2
4	0930	21	41 03	70 53	19	39.6	23	27	45.0	12	01	4	7	7	4	25	2
5	1000	21	40 59	70 54	25	39.0	23	27	45.0	12	03	5-6	8	7	4	25	2
6	1030	21	40 53	70 54	28	39.1	23	28	48.0	12	02	4-6	8	7	4	25	2
7	1100	21	40 50	70 53	29	39.0	23	27	48.0	11	02	4-6	8	7	4	25	2
8	1130	21	40 46	70 53	30	39.5	23	27	48.0	11	02	5-7	8	7	4	25	2
9	1200	21	40 43	70 52	32	39.5	23	27	49.0	12	02	5-7	8	7	4	25	2
10	1230	21	40 40	70 53	35	39.6	23	26	49.0	11	02	5-7	8	7	4	25	2
11	1300	21	40 37	70 52	38	43.6	23	28	48.6	11	02	5	6	7	4	25	2
12	1400	21	40 33	70 52	39	45.2	14	38	45.0	11	02	5	6	7	4	25	3
13	1430	21	40 29	70 52	40	41.7	19	32	44.0	10	02	5	6	7	4	25	3
14	1500	21	40 25	70 52	47	40.8	19	27	44.0	10	02	4	4	7	5	--	--
15	1530	21	40 22	70 52	52	42.6	19	30	45.0	10	02	5	4	7	5	--	--
16	1600	21	40 19	70 52	63	41.1	19	30	45.0	10	02	5	6	7	5	25	2
17	1630	21	40 16	70 52	68	39.4	19	25	45.0	10	02	5	6	7	5	--	--
18	1700	21	40 13	70 52	72	43.1	20	30	45.0	09	03	6	6	7	5	--	--
19	1730	21	40 10	70 52	76	43.0	20	30	45.0	09	01	5	5	7	5	--	--
20	1800	21	40 06	70 51	85	46.5	20	30	51.5	08	02	5	5	7	5	--	--
21	1830	21	40 02	70 50	138	48.3	20	30	51.5	08	02	5	5	7	5	--	--
22	2000	21	39 55	70 58	356	43.7	20	30	51.0	06	02	5	7	7	5	--	--
23	2100	21	39 50	71 07	402	42.6	20	30	51.0	06	02	5	7	7	5	--	--
24	2200	21	39 49	71 15	700	47.4	20	31	56.0	04	01	0-2	7	7	5	--	--
25	2300	21	39 45	71 25	650	50.8	20	31	53.0	03	03	0-5	7	7	5	--	--
26	0000	22	39 35	71 32	618	48.0	20	31	52.0	02	03	5	8	7	5	--	--
27	1915	22	38 54	72 53	62	50.9	29	20	34.0	19	02	--	0	7	5	--	--
28	2000	22	38 59	72 57	50	49.6	29	18	33.0	19	02	--	0	8	5	--	--
29	2100	22	39 00	72 59	43	48.3	29	18	32.5	20	03	1	1	8	5	--	--
30	2200	22	39 05	73 07	36	45.6	32	19	32.0	25	02	1	1	8	5	--	--
31	2300	22	39 09	73 12	34	42.6	32	18	30.0	25	03	5-1	2	8	4	--	--
32	2330	22	39 11	73 13	33	42.0	32	18	30.0	22	02	5-1	2	8	4	--	--
33	0000	23	39 13	73 15	32	41.8	32	17	29.0	23	02	5-1	2	8	4	--	--
34	0030	23	39 16	73 20	29	41.3	29	17	28.0	23	02	5-1	2	8	4	--	--
35	0100	23	39 20	73 24	26	41.1	27	18	28.5	23	02	5-1	2	8	4	--	--
36	0150	23	39 23	73 30	24	40.0	27	20	28.0	24	02	5-1	2	8	4	--	--
37	0640	23	39 03	73 03	44	47.4	27	20	34.0	25	02	2	2	8	4	--	--
38	0737	23	38 56	72 55	62	49.5	27	25	37.0	25	02	2	2	8	4	--	--
39	0850	23	38 56	72 57	80	50.1	27	25	36.0	25	02	2	2	8	4	--	--
40	1005	23	38 52	72 56	140	50.1	27	30	37.0	25	02	2	2	8	4	--	--
41	1100	23	38 50	72 58	164	50.5	27	30	36.0	26	02	2	2	8	4	--	--
42	1200	23	38 49	73 02	124	51.5	27	25	34.0	26	03	8	2	8	4	--	--
43	1320	23	38 47	73 12	75	51.7	30	20	34.5	26	03	8	2	8	4	--	--
44	1400	23	38 45	73 15	58	52.1	30	20	34.0	27	03	8	2	8	4	--	--
45	1500	23	38 42	73 21	46	51.7	30	20	35.0	26	02	8	2	8	4	--	--
46	1600	23	38 40	73 27	42	46.8	28	15	34.0	29	01	8	2	8	4	--	--

Appendix Table 1. --Basic data for bathythermograph casts (data coded where necessary in accordance with H.O. Pub. No. 607--Instruction manual for oceanographic observations), *Albatross III* Cruise no. 126, + 5 time zone (Continued)

January 1959

Consec. slide no.	Greenwich mean time hour	date	Lat. N.	Long. W.	Depth fm.	Sea surf. temp. °F.	Wind dir.	Wind kn.	Dry bulb temp. °F.	Bar. mb.	Weather	Clouds type	Clouds amt.	Vis.	Swell sea	Swell dir.	Swell amt.
47	1700	23	38 37	73 36	36	45.5	28	10	34.0	28	02	4	2	8	4	--	--
48	1800	23	38 34	73 42	36	47.0	28	8	34.0	28	01	5	2	8	4	--	--
49	1900	23	38 32	73 49	34	46.9	27	5	36.8	27	01	1	5	8	3	--	--
50	2000	23	38 28	73 56	30	46.4	27	4	36.0	27	01	--	0	8	3	--	--
51	2100	23	38 25	74 08	32	46.0	27	6	38.0	28	02	--	0	8	3	--	--
52	2200	23	38 23	74 16	28	46.5	27	5	36.0	28	03	6	5	8	3	--	--
53	2255	23	38 20	74 21	23	47.2	27	5	36.0	28	01	4	1	8	3	--	--
54	0230	24	38 17	74 19	20	48.6	00	0	36.0	30	02	4	1	8	2	--	--
55	0430	24	38 08	74 04	40	47.9	5	5	40.0	31	03	3	2	8	2	--	--
56	0540	24	38 04	74 00	60	48.8	27	1	43.0	30	01	3	1	8	2	--	--
57	0710	24	37 59	73 57	81	57.3	0	0	41.0	30	01	3	1	8	2	--	--
58	0825	24	37 56	73 57	97	61.5	var.	3	44.0	30	01	3	1	8	2	--	--
59	0935	24	37 55	73 60	115	61.0	var.	lt.	45.0	28	03	2-5	5	8	2	--	--
60	1050	24	37 57	73 57	167	61.0	var.	lt.	47.0	28	02	2-5	5	8	2	--	--
61	1200	24	37 55	73 58	160	60.5	23	10	46.8	26	03	2-4	5	8	2	--	--
62	1300	24	37 55	74 06	60	57.5	18	20	45.0	26	03	2-4	6	8	2	--	--
63	1330	24	37 55	74 11	43	50.8	18	20	43.0	26	02	2-4	6	8	2	--	--
64	1405	24	37 56	74 17	37	48.9	18	20	44.0	25	02	2-4	6	8	2	27	1
65	1430	24	37 50	74 24	31	49.0	21	20	44.0	24	01	4-5	2	8	3	18	2
66	1500	24	37 57	74 29	28	46.9	21	25	47.0	23	02	4-5	2	8	3	18	2
67	1530	24	37 56	74 34	23	45.3	21	20	48.0	23	02	4-5	2	8	3	18	2
68	1600	24	37 57	74 39	19	44.5	21	25	48.0	19	03	6	3	8	3	18	3
69	0155	25	37 50	74 50	19	44.2	21	30	44.5	19	01	3	2	8	4	19	3
70	0300	25	37 47	74 42	25	48.1	21	30	48.0	19	02	3	3	8	4	19	3
71	0500	25	37 40	74 27	38	55.0	21	30	50.0	18	02	3	3	8	4	19	4
72	0610	25	37 37	74 27	51	54.5	21	30	48.0	17	02	3	3	8	5	19	4
73	0737	25	37 33	74 19	130	57.5	23	30	51.0	16	03	2	6	8	5	19	4
74	0900	25	37 30	74 22	52	55.5	23	25	52.0	16	02	2	6	8	5	19	4
75	1000	25	37 27	74 30	234	51.5	23	21	51.0	16	03	1-2-4	6	8	4	19	3
76	1100	25	37 24	74 33	45	47.5	27	17	51.0	15	03	1-2-4	7	8	4	19	3
77	1200	25	37 21	74 30	31	44.5	27	12	50.0	15	02	1-2-4	7	8	4	19	3
78	1300	25	37 18	74 44	28	43.8	15	22	51.0	15	02	1-2-4	5	8	3	19	3
79	1400	25	37 16	74 52	28	42.7	18	12	49.0	15	01	4	4	7	3	19	3
80	1500	25	37 11	74 57	20	43.9	18	15	48.0	15	02	4	3	7	3	19	3
81	1600	25	37 07	75 06	18	44.0	24	10	48.0	15	01	6	2	7	3	19	3
82	1700	25	37 03	75 11	20	43.2	24	10	48.0	14	01	6	1	7	3	19	3
83	1800	25	36 57	75 15	14	42.7	24	10	47.5	14	02	3	6	8	3	18	3
84	0200	26	36 49	75 15	17	43.7	36	10	44.0	15	02	2	3	9	3	19	3
85	0325	26	36 47	75 01	19	45.1	36	15	52.0	15	02	4-6	5	8	3	19	3
86	0450	26	36 47	74 51	25	53.6	36	22	57.0	15	03	4	6	8	3	19	3
87	0610	26	36 45	74 45	45	52.6	05	20	55.0	16	02	4	6	8	3	19	3
88	0830	26	36 48	74 40	99	59.5	05	10	55.0	15	02	4	6	8	3	19	3
89	0940	26	36 46	74 40	84	59.7	05	10	62.0	15	02	4	6	8	3	19	3
90	1105	26	36 45	74 40	155	61.5	05	10	55.8	16	02	4	6	8	3	19	3

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January 1959

Consec. slide no.	Greenwich mean time hour	date	Lat. N.	Long. W.	Depth fm.	Sea surf. temp. °F.	Wind dir.	Wind kn.	Dry bulb temp. °F.	Bar. mb.	Wea-ther	Clouds type	Clouds amt.	Vis.	Swell sea	Swell dir.	Swell amt.
91	1200	26	36 39	74 43	50	58.9	09	10	55.0	16	03	4	7	8	3	14	3
92	1300	26	36 35	74 48	29	53.0	05	5	56.0	16	02	4-6	7	7	3	16	3
93	1400	26	36 29	74 51	19	54.5	05	10	53.0	16	02	4-6	8	7	3	16	3
94	1500	26	36 24	74 55	17	58.1	05	12	53.0	16	02	4-6	8	7	3	16	3
95	1700	26	36 11	75 05	20	57.7	14	5	56.5	17	01	4	4	7	3	16	3
96	1900	26	35 57	75 15	16	55.1	14	5	57.0	16	01	--	0	8	3	16	3
97	2000	27	35 51	75 17	12	55.4	var.	4	60.0	00	00	--	0	8	2	16	2
98	0155	28	35 43	75 14	19	55.1	05	5	56.0	16	03	1-4	3	8	3	04	3
99	0415	28	35 46	75 00	27	58.9	14	10	62.0	16	03	1	3	8	4	05	4
100	0420	28	35 46	75 00	27	58.9	14	10	62.0	16	03	1	3	8	4	05	4
101	0520	28	35 46	74 53	45	63.4	14	5	64.0	16	02	2	2	8	4	05	3
102	0640	28	35 49	74 53	46	63.5	var.	--	64.0	15	02	2	2	8	3	05	3
103	0800	28	35 47	74 52	66	63.7	var.	--	63.0	14	03	2-5	4	8	3	05	3
104	0925	28	35 45	74 50	85	64.0	var.	--	64.0	14	02	2-5	4	8	3	05	3
105	1035	28	35 43	74 51	183	63.9	32	10	62.0	14	03	2-5-6	7	8	3	05	3
106	0310	29	34 06	75 58	240	73.8	02	20	63.0	19	03	6	8	8	4	05	4
107	1735	30	35 46	74 48	490	60.1	32	10	64.0	18	02	4	9	7	3	36	3
108	1835	30	35 53	74 43	497	58.9	32	18	58.0	18	02	4	9	6	3	36	3
109	1930	30	36 01	74 38	383	59.5	32	30	56.0	21	25	--	9	6	3	36	3
110	2023	30	36 08	74 33	488	56.5	32	28	54.0	21	00	--	9	6	4	36	3
111	2130	30	36 16	74 32	800	63.2	32	32	54.0	21	00	--	9	6	4	36	3
112	2230	30	36 21	74 28	1050	63.1	32	30	50.0	21	00	--	9	6	4	36	3
113	2330	30	36 29	74 25	1200	64.2	32	30	49.0	21	02	--	9	6	4	36	3
114	0030	31	36 37	74 21	1000	63.5	32	25	48.0	22	25	--	9	6	4	36	3
115	0130	31	36 43	74 17	1058	62.7	34	20	48.0	23	02	6-8	8	6	4	36	3
116	0230	31	36 50	74 12	1178	56.5	34	20	48.0	24	02	6-8	8	6	4	36	3
117	0330	31	36 57	74 07	1243	56.2	34	19	47.0	25	02	6-8	8	6	4	36	3
118	0430	31	37 04	74 04	1210	54.6	34	19	47.0	26	02	6-8	8	6	4	36	3
119	0530	31	37 10	73 59	1095	53.9	34	19	46.0	26	02	6-8	8	6	4	36	3
120	0630	31	37 18	73 57	978	60.1	34	20	46.0	26	02	6-8	8	6	4	36	3
121	0710	31	37 22	73 56	1012	58.4	36	20	44.0	26	02	6-8	7	7	4	36	3
122	0800	31	37 27	74 04	813	57.1	36	21	43.0	25	01	1-6-8	7	7	4	36	3
123	0900	31	37 32	74 11	556	58.8	36	20	43.0	25	02	1-6-8	7	7	3	36	3
124	1100	31	37 37	74 15	180	56.2	36	20	42.0	27	01	2-5	7	8	3	36	3
125	1215	31	37 38	74 16	78	56.3	34	15	40.0	27	02	2-5	7	8	3	36	3
126	1330	31	37 47	74 17	44	51.0	35	15	42.0	28	02	2	4	7	3	36	3
127	1430	31	37 56	74 19	35	47.3	35	15	41.0	29	02	2	4	7	3	36	3
128	1530	31	38 05	74 22	26	45.9	35	20	40.0	30	02	2	4	7	3	36	3
129	1630	31	38 13	74 23	23	46.2	35	18	38.0	30	02	2	4	6	3	32	3
130	1730	31	38 22	74 25	21	44.7	35	19	37.0	30	02	2	4	6	3	32	3
131	1830	31	38 31	74 27	20	42.3	35	18	36.0	30	02	2	3	6	3	32	3
132	1930	31	38 40	74 28	18	42.1	35	20	36.0	31	02	0-1	2	7	2	32	2
133	2030	31	38 49	74 31	11	40.3	35	30	31.0	31	02	0-1	2	7	2	32	2
134	2130	31	38 57	74 32	11	39.0	35	18	28.0	32	02	0-1	2	7	2	32	2
135	2230	31	38 51	74 22	15	41.6	35	18	30.0	33	02	0-1	2	7	2	32	2
136	2330	31	38 46	74 13	18	43.6	35	18	30.0	33	02	0-1	2	7	2	32	2

Appendix Table 1.--Basic data for bathythermograph casts (data coded where necessary in accordance with H.O. Pub. No. 607--Instruction mannual for oceanographic observations), *Albatross III* Cruise no. 126, +5 time zone (Continued)

February 1959

Consec. slide no.	Greenwich mean time hour	date	Lat. N.	Long. W.	Depth fm.	Sea surf. temp. °F.	Wind dir.	Wind kn.	Dry bulb temp. °F.	Bar. mb.	Weather	Clouds type	Clouds amt.	Vis.	Swell sea	Swell dir.	Swell amt.
137	0030	1	38 41	74 03	26	44.1	35	15	31.0	33	02	0-1	2	7	2	32	2
138	0245	1	38 32	73 52	31	44.7	05	15	31.0	34	02	1-8	3	8	2	32	2
139	0435	1	38 29	73 38	46	46.8	05	10	32.0	34	02	1-8	7	7	2	32	2
140	0615	1	38 24	73 38	63	52.1	36	10	33.0	34	03	1-8	7	7	2	32	2
141	0810	1	38 25	73 25	83	49.7	36	10	31.0	32	03	1-8	8	7	2	32	2
142	0910	1	38 26	73 24	108	50.8	36	10	31.0	32	02	1-8	8	7	2	32	2
143	1015	1	38 27	73 21	170	51.6	36	12	29.0	33	03	1-8	8	7	2	32	2
144	1225	1	38 35	73 13	160	49.1	36	15	29.0	34	01	1-4-8	7	7	2	32	2
145	1330	1	38 38	73 05	498	48.6	36	15	29.0	34	02	4-5	7	7	2	32	2
146	1430	1	38 43	72 56	687	47.4	36	18	25.0	34	02	4-5	8	7	2	32	2
147	1530	1	38 48	72 49	750	47.6	36	15	25.0	34	02	4-5	7	7	2	32	2
148	1630	1	38 55	72 43	571	48.5	36	18	25.0	34	02	4-5	8	7	3	32	3
149	1730	1	38 58	72 32	816	47.1	36	19	25.0	34	02	6	8	6	3	36	3
150	1830	1	39 02	72 25	790	48.1	36	20	25.0	34	02	6	8	6	3	36	3
151	1930	1	39 07	72 17	692	47.4	36	20	25.0	34	03	6-8	8	6	3	36	3
152	2030	1	39 10	72 09	515	47.2	36	20	28.0	34	70	6-8	8	6	3	36	3
153	2100	1	39 19	71 56	712	48.0	36	20	27.0	35	01	6-8	7	6	3	36	3
154	2130	1	39 22	71 58	715	48.4	36	22	25.0	36	02	6-8	7	6	3	36	3
155	0420	2	39 31	72 08	168	51.0	36	18	25.0	37	02	8	7	7	3	36	2
156	0555	2	39 32	72 09	104	49.6	36	10	25.0	37	02	8	6	7	3	36	3
157	0655	2	39 34	72 09	86	50.0	34	15	23.0	36	01	8	5	7	3	36	3
158	0845	2	39 39	72 18	66	46.3	34	12	23.0	34	02	8	5	7	3	36	3
159	1045	2	39 48	72 27	45	45.9	29	10	23.0	32	01	8	4	7	3	36	3
160	1255	2	39 51	72 36	34	39.9	29	15	25.0	32	02	2-5-8	3	7	3	36	3
161	1430	2	39 51	72 19	47	42.5	27	10	23.0	31	02	--	0	8	3	36	3
162	1530	2	39 50	72 06	52	41.8	27	15	29.0	31	02	--	0	8	2	36	2
163	1630	2	39 49	71 53	90	47.6	27	1	30.0	30	02	--	0	8	2	36	2
164	1730	2	39 50	71 42	190	43.0	27	5	31.0	30	02	--	0	8	2	36	2
165	1830	2	39 50	71 32	398	42.7	27	10	31.0	29	02	--	0	8	2	36	2
166	1930	2	39 48	71 19	473	44.8	27	18	31.3	28	03	8	2	8	2	36	2
167	2030	2	39 48	71 08	543	44.0	27	18	32.0	28	02	8	2	8	2	36	2
168	2130	2	39 49	70 56	642	44.6	27	15	34.0	28	02	8	2	8	2	36	2
169	2230	2	39 49	70 45	673	45.0	27	18	33.0	26	02	8	2	8	2	36	2
170	2330	2	39 49	70 33	626	44.7	27	18	33.0	25	02	8	2	8	2	36	2
171	0030	3	39 50	70 22	548	44.5	27	20	33.0	25	02	8	2	8	2	36	2
172	0230	3	40 00	70 17	180	42.3	27	25	35.0	24	02	8	2	8	3	36	3
173	0400	3	40 01	70 15	127	42.1	27	25	37.0	24	02	8	2	8	3	36	3
174	0545	3	40 03	70 14	100	42.2	27	25	36.0	24	02	8	2	8	4	36	4
175	0810	3	40 06	70 17	84	42.2	27	25	38.0	21	02	8	2	8	4	36	4
176	1005	3	40 11	70 17	63	44.8	27	20	38.0	20	01	8	1	8	4	36	4
177	1230	3	40 24	70 21	45	41.8	25	22	38.0	18	02	8	2	7	3	27	4
178	1330	3	40 19	70 23	51	41.9	20	20	38.0	17	02	8	3	7	3	27	3
179	1530	3	40 08	70 32	67	42.3	23	18	42.0	15	03	5	7	7	3	27	3
180	1730	3	39 59	70 39	172	44.9	23	5	44.0	12	01	5	4	7	3	27	3
181	1930	3	39 49	70 47	398	44.6	23	20	46.0	08	02	5	4	7	3	27	3
182	2100	3	39 42	70 52	1058	44.5	23	22	49.0	07	03	5	5	7	3	27	3
183	2200	3	39 50	70 58	514	44.9	23	22	48.0	05	03	5	6	7	3	27	3

APPENDIX II, TEMPERATURE PROFILES

The profiles presented in figures A-1 to A-18 are based on the bathythermograph casts. They are all, by necessity, somewhat diagrammatic. This is particularly true of the profiles presenting both temperature and fishing data. In order to fish in various depths, it was frequently necessary to search around somewhat to find trawlable bottom. For this reason some of the profiles are not straight lines across the shelf, especially on the edge of the shelf.

The various temperature and fishing profiles are presented in more or less geographic order, from north to south.

Bottom water temperatures given for stations at depths exceeding 150 fathoms were determined by extrapolating bathythermograph data and should be considered gross estimates.

Figure A-1.--Temperature profile A-B and B-C.
Figure A-2.--Temperature profile U-V.
Figure A-3.--Temperature profile T-U.
Figure A-4.--Temperature profile S-T.
Figure A-5.--Temperature profile R-S.
Figure A-6.--Temperature profile D-E.
Figure A-7.--Temperature profile Q-R.
Figure A-8.--Temperature profile E-F.
Figure A-9.--Temperature profile P-Q.
Figure A-10.--Temperature profile F-G.
Figure A-11.--Temperature profile N-O-P.
Figure A-12.--Temperature profile H-I.
Figure A-13.--Temperature profile G-H.
Figure A-14.--Temperature profile I-J.
Figure A-15.--Temperature profile J-K.
Figure A-16.--Temperature profile K-L.
Figure A-17.--Temperature profile L-M.
Figure A-18.--Temperature profile M-N.

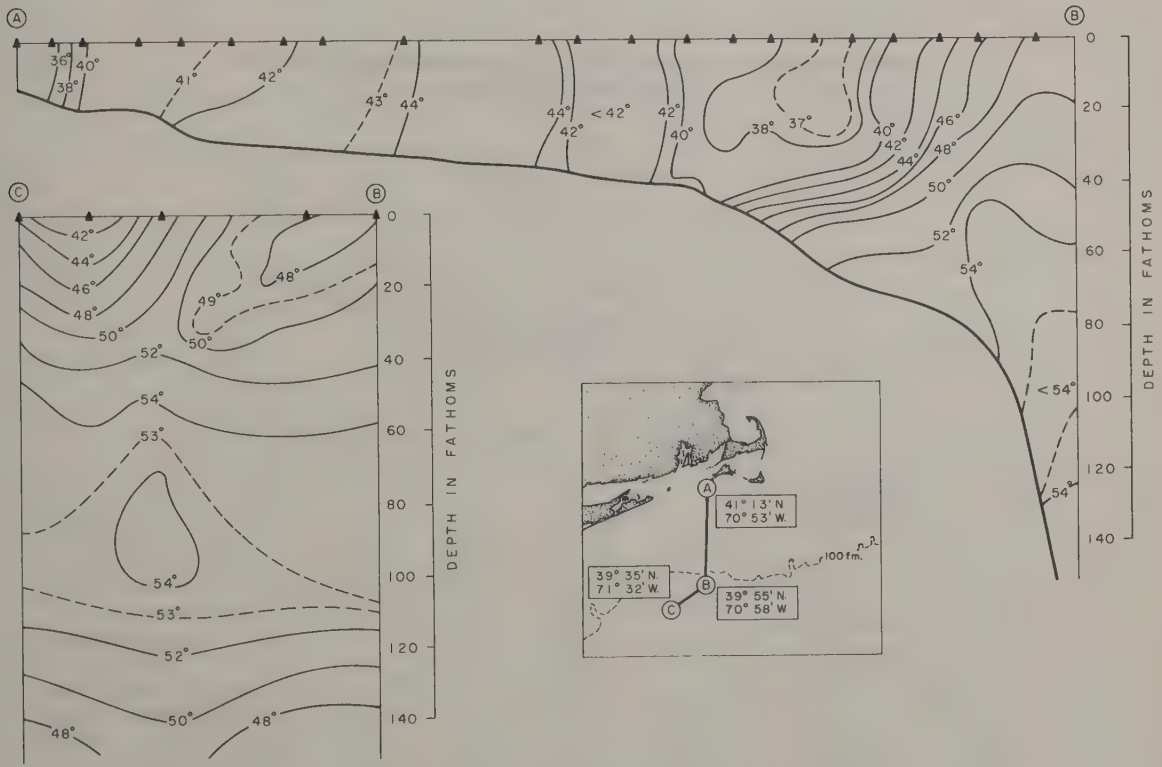

Figure A-1.--Temperature profile A-B and B-C. Data from bathythermograph casts 1 to 21, and 21 to 26, January 21-22, 1959.

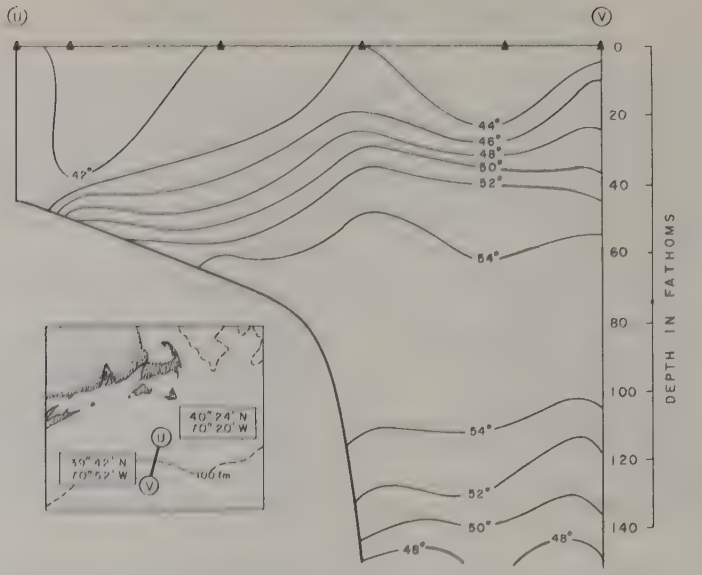

Figure A-2.--Temperature profile U-V. Data from bathythermograph casts 177 to 182, February 3-4, 1959.

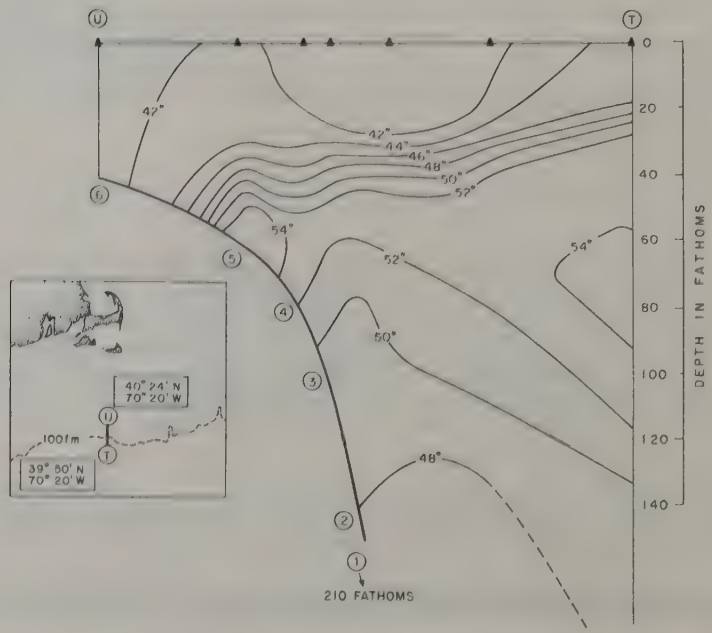

Figure A-3.--Temperature profile T-U. Data from bathythermograph casts 172 to 177, February 3, 1959.

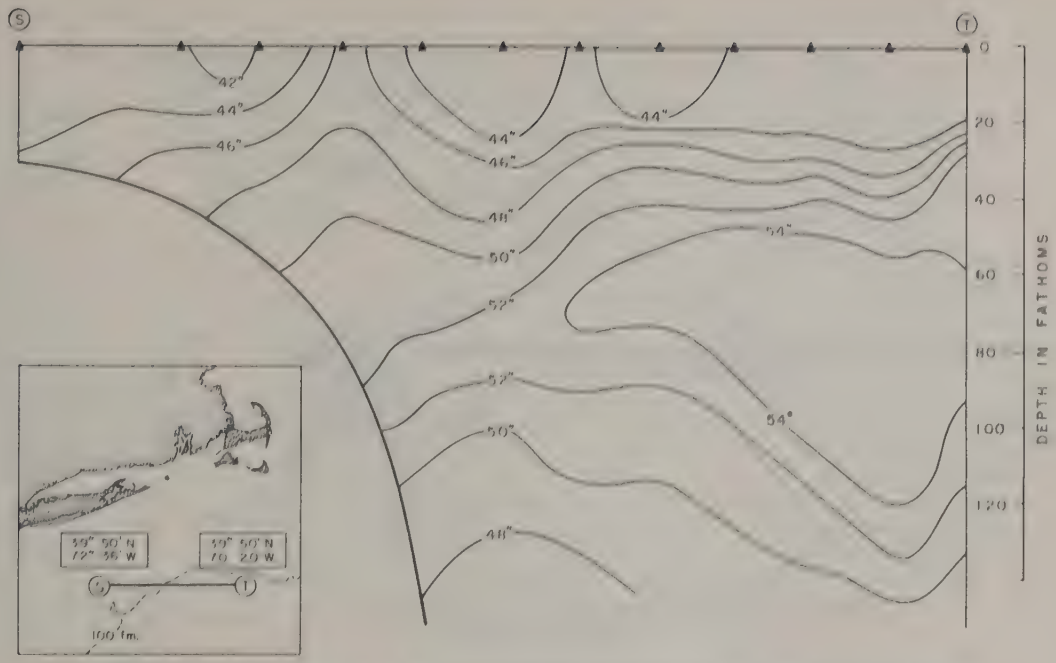

Figure A-4.--Temperature profile S-T. Data from bathythermograph casts 160 to 171, February 2-3, 1959.

Appendix table 2.--Principal species caught, fishing transect 1 (Martha's Vineyard), February 3, 1959

[See Figure A-3]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]					
	6 (46.5)	5 (64)	4 (82.5)	3 (99)	2 (140)	1 (210)
Spiny dogfish:						
Male	48	---	14	423	---	2
Female	11	---	353	5	---	---
Barndoor skate	---	---	---	---	2	2
Silver hake	17	---	---	---	300	280
American hake	---	---	---	---	130	72
White hake	---	---	---	---	1	26
Red hake	2	---	---	---	105	---
Long-finned hake	---	---	---	---	1	68
Fluke	---	4	---	---	---	---
Four spot	1	---	---	3	4	---
Grey sole	---	---	---	---	4	34
Butterfish	---	---	277	1,500	---	---
Black-bellied redfish	---	---	---	---	9	3
Armored sea robin	---	---	---	9	---	---
Angler	4	1	---	7	5	11

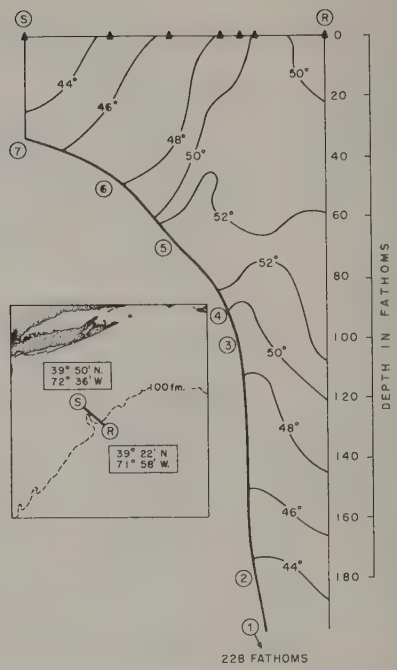

Figure A-5.--Temperature profile R-S. Data from bathythermograph casts 153 to 160, February 2, 1959.

Appendix table 3.--Principal species caught, fishing transect 10 (Hudson Canyon), February 2, 1959

[See figure A-5]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]						
	7 (32)	6 (46)	5 (67)	4 (92)	3 (103)	2 (178)	1 (228)
Spiny dogfish:							
Male	10	40	5	---	---	---	---
Female	---	2	5	---	---	---	---
Barndoor skate	---	16	2	---	1	---	---
Leopard skate	---	---	2	---	---	---	---
Silver hake	[1] 13	---	29	---	---	280	---
American hake	---	---	---	---	---	360	62
White hake	---	---	---	---	---	16	5
Red hake	---	178	---	---	---	36	---
Long-finned hake	---	---	---	---	---	16	8
Fluke	1	---	---	---	---	---	---
Grey sole	---	---	---	---	---	1	11
Butterfish	---	41	149	---	---	---	---
Scup	---	90	387	---	---	---	---
Black-bellied redfish	---	---	---	---	4	17	2
Armored sea robin	---	---	---	---	21	---	---
Angler	---	8	---	---	---	1	2

[1] Young-of-the-year and immature fish

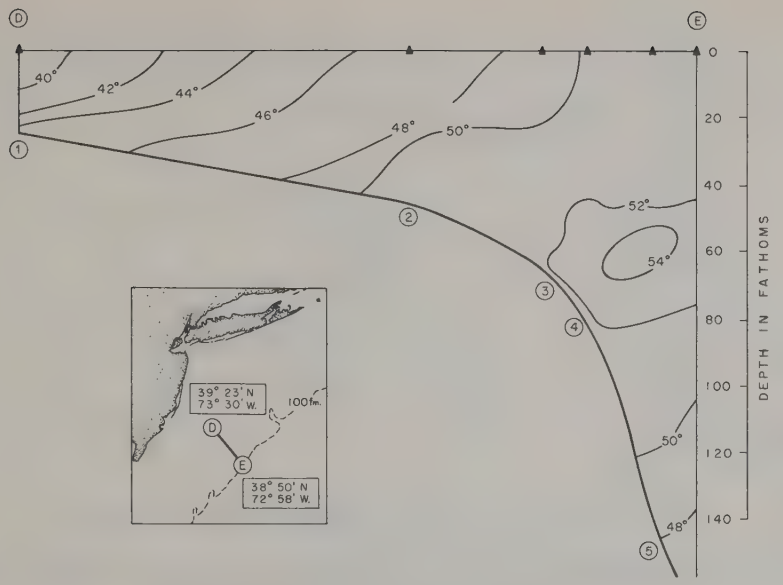

Figure A-6.--Temperature profile D-E. Data from bathythermograph casts 36 to 41, January 23, 1959.

Appendix table 4.--Principal species caught, fishing transect 3 (Barnegat), January 23, 1959

[See figure A-6]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]				
	1 (25)	2 (45)	3 (62)	4 (80)	5 (159)
Big skate	---	2	2	---	---
Leopard skate	---	---	---	1	---
Silver hake	---	1	23	12	407
Red hake	---	---	1	---	54
Four spot	---	---	2	---	---
Grey sole	---	---	---	---	2
Butterfish	---	8	17	---	---
Mackerel	1	12	2	---	---
Scup	---	---	1	---	---
Black-bellied redfish	---	---	---	---	7
Angler	---	3	1	---	8

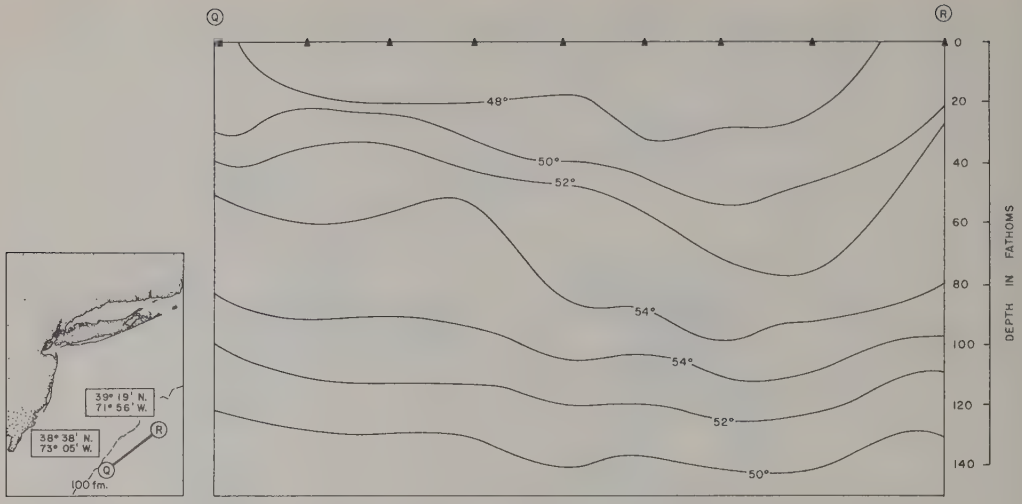

Figure A-7.--Temperature profile Q-R. Data from bathythermograph casts 145 to 153, January 1-2, 1959.

Figure A-8.--Temperature profile E-F. Data from bathythermograph casts 41 to 53, January 23-24, 1959.

Figure A-9.--Temperature profile P-Q. Data from bathythermograph casts 134 to 143, February 1, 1959.

Appendix table 5.--Principal species caught, fishing transect 9 (Cape May), February 1, 1959

[See figure A-9]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]						
	1 (32)	2 (43)	3 (62)	4 (86)	5 (117)	7 (153)	6 (180)
Spiny dogfish:							
Male	53	144	251	---	---	---	---
Female	4	138	466	---	---	---	---
Brier skate	1	---	---	---	---	1	1
Leopard skate	---	---	---	6	6	---	---
Silver hake	17	---	---	80	±1,125	850	415
American hake	---	---	---	---	---	27	+125
White hake	---	---	---	---	---	15	21
Red hake	1	---	---	1	49	17	---
Spotted hake	---	1	---	6	---	---	---
Long-finned hake	---	---	---	---	---	---	4
Fluke	2	1	---	3	1	---	---
Four spot	1	1	1	1	2	---	---
Grey sole	---	---	---	---	5	3	3
Butterfish	52	1,120	---	5	1	---	---
Sea bass	---	23	5	---	---	---	---
Scup	3	121	2	1	---	---	---
Black-bellied redfish	---	---	---	---	1	30	13
Common sea robin	105	11	---	---	---	---	---
Armored sea robin	---	---	---	---	1	1	---
Angler	5	1	---	---	4	13	13

Appendix table 6.--Principal species caught, fishing transect 4 (Delaware Bay), January 24, 1959

[See figure A-10]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]							
	1 (30)	2 (42)	3 (65)	4 (80)	5 (100)	6 (125)	7 (150)	8 (220)
Spiny dogfish:								
Male	14	54	2	1	---	---	---	---
Female	---	66	1	1	---	---	---	---
Barndoor skate	---	---	---	---	---	---	1	---
Big skate	1	2	---	---	---	---	---	---
Brier skate	---	1	2	1	---	---	---	---
Leopard skate	---	---	---	---	3	1	---	---
Silver hake	[1] 10	6	1	11	113	72	72	---
American hake	---	---	---	---	---	---	---	127
White hake	---	---	---	---	---	---	---	46
Red hake	1	---	1	4	15	5	36	---
Spotted hake	---	---	---	2	1	---	---	---
Long-finned hake	---	---	---	---	---	---	---	6
Fluke	1	4	---	---	---	---	---	---
Four spot	---	---	---	1	---	---	---	---
Grey sole	---	---	---	---	---	2	2	3
Butterfish	1	10	54	4	---	---	---	---
Sea bass	---	5	19	1	3	---	---	---
Scup	1	80	3	1	---	---	---	---
Black bellied rosefish	---	---	---	---	---	2	4	7
Common sea robin	---	4	1	---	---	---	---	---
Armored sea robin	---	---	---	---	2	---	4	1
Angler	6	1	1	1	1	2	9	30

[1] Young-of-the-year

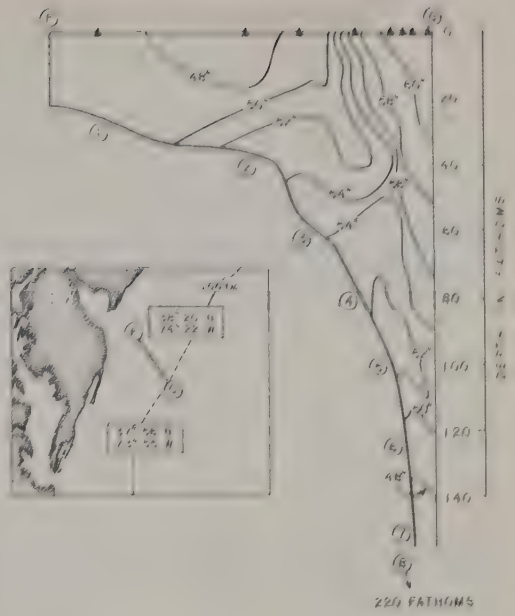

Figure A-10.--Temperature profile F-G. Data from bathythermograph casts 54 to 61, January 24, 1959.

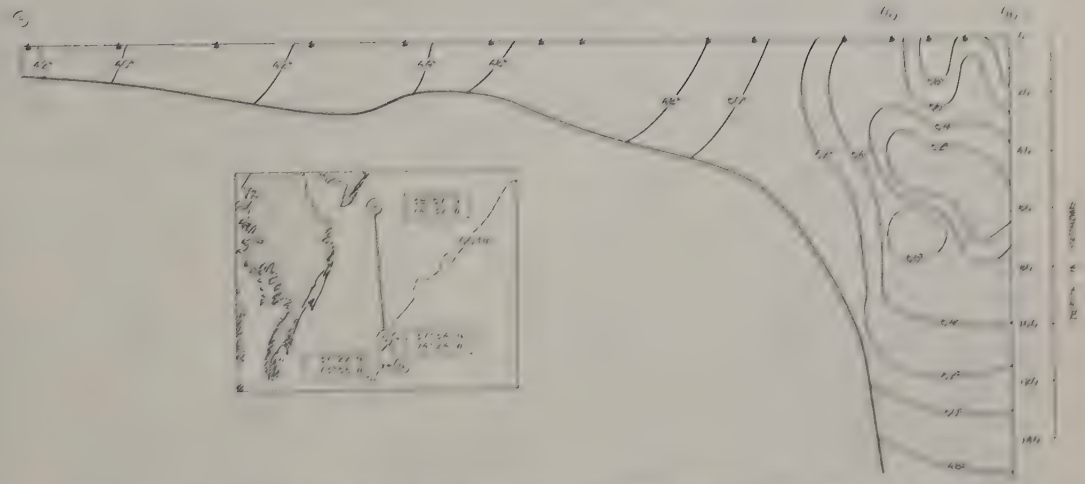

Figure A-11.--Temperature profile N-O-P. O-P: Data from bathythermograph casts 124 to 134, January 31 to February 1, 1959. N-O: Data from bathythermograph casts 121 to 124, January 31, 1959.

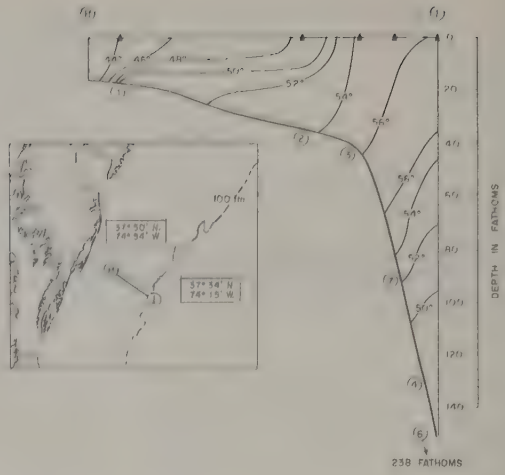

Figure A-12.--Temperature profile H-1. Data from bathythermograph casts 69-73, January 25, 1959.

Appendix Table 7.--Principal species caught, fishing transect 5 (Winter Quarter), January 25, 1959

[See figure A-12]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]					
	1 (18)	2 (37)	3 (48)	7 (92)	4 (130)	6 (238)
Spiny dogfish:						
Male	58	4	1	17	---	---
Female	1	1	---	8	---	---
Big skate	1	---	---	---	---	---
Deier skate	---	---	2	2	---	---
Leopard skate	---	2	---	2	---	---
Silver hake	2	---	---	[1] 334	[1] 230	---
American hake	---	---	---	---	---	66
White hake	---	---	---	---	---	49
Red hake	---	---	---	61	---	---
Spotted hake	2	---	---	6	---	---
Long-finned hake	---	---	---	---	---	29
Fluke	---	2	---	4	---	---
Four spot	---	---	1	6	---	---
Grey sole	---	---	---	---	---	2
Butterfish	6	1	---	---	---	---
Sea bass	---	2	6	---	---	---
Scup	1	399	4	---	1	---
Black-bellied redfish	---	---	---	---	---	2
Angler	3	---	---	2	3	17

[1] Mostly immature fish

Appendix table 8.--Principal species caught, fishing transect 6 (Cape Charles), January 25, 1959

[See figure 15-A]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]					
	1 (17)	2 (24)	3 (42)	4 (77)	5 (107)	6 (173)
Spiny dogfish:.						
Male.....	---	25	---	---	---	---
Female.....	---	56	1	---	---	---
Barndoor skate.....	---	---	---	---	---	1
Brier skate.....	---	---	1	---	---	---
Silver hake.....	[1] 5	---	---	6	450	540
American hake.....	---	---	---	---	---	24
White hake.....	---	---	---	---	1	4
Red hake.....	---	---	---	---	33	2
Spotted hake.....	---	---	1	1	12	2
Long-finned hake.....	---	---	---	---	---	16
Fluke.....	1	2	2	---	1	---
Grey sole.....	---	---	---	---	---	1
Butterfish.....	7	---	---	---	---	---
Sea bass.....	---	3	4	15	8	---
Scup.....	---	---	46	8	---	---
Black-bellied redfish.	---	---	---	---	2	2
Common sea robin.....	---	6	45	6	1	---
Angler.....	---	---	---	---	15	45

[1] Young-of-the-year

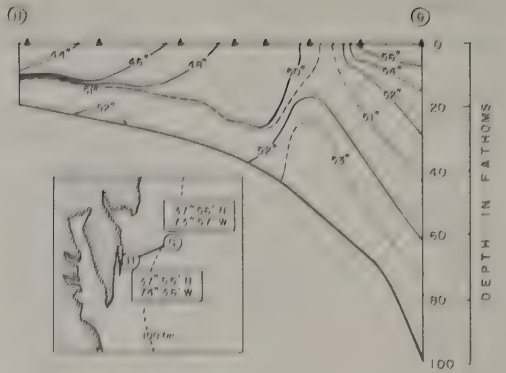

Figure A-13.--Temperature profile G-H. Data from bathythermograph casts 60 to 69, January 24-25, 1959.

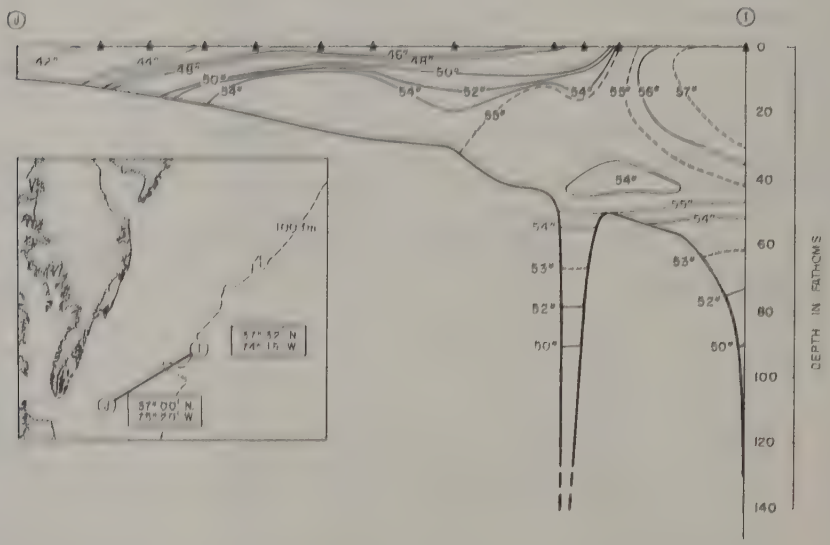

Figure A-14.--Temperature profile I-J. Data from bathythermograph casts 73 to 83, January 24-25, 1959.

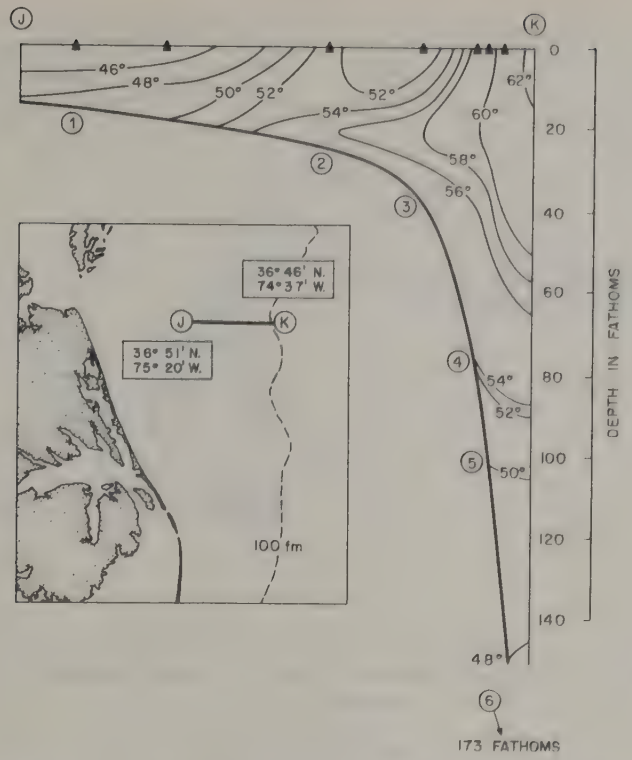

Figure A-15.--Temperature profile J-K. Data from bathythermograph casts 84 to 90, January 25, 1959.

Figure A-16.--Temperature profile K-L. Data from bathythermograph casts 90 to 97, January 26-27, 1959.

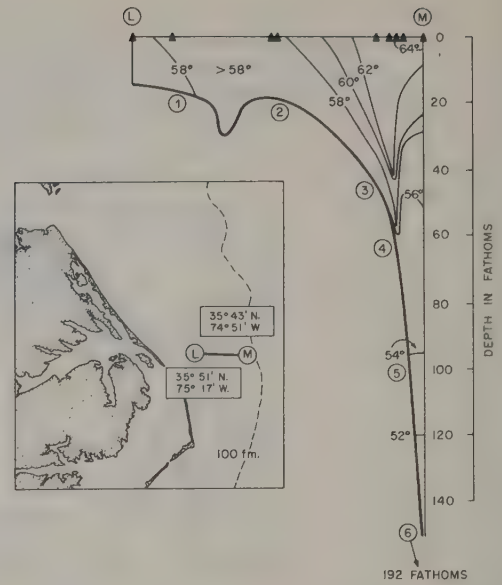

Figure A-17.--Temperature profile L-M. Data from bathythermograph casts 98 to 106, January 27, 1959.

Appendix table 9.--Principal species caught, fishing transect 7 (Albermarle), January 27, 1959

[See figure A-7]

Species	Number taken at station -- [Average depth of tow (in fathoms) in parentheses]					
	1 (19)	2 (26)	3 (45)	4 (64)	5 (80)	6 (192)
Brier skate	1	5	4	1	---	---
Leopard skate	---	---	1	1	---	---
Silver hake	---	---	---	3	123	[1] 332
American hake	---	---	---	---	---	4
Red hake	---	---	[2] 1	---	---	7
Spotted hake	---	---	---	---	7	4
Long-finned hake	---	---	---	---	---	4
Fluke	---	3	---	1	---	---
Four spot	---	---	1	---	1	---
Butterfish	---	---	---	---	6	---
Black-bellied redfish.	---	---	---	---	---	2
Angler	2	---	---	---	2	1

[1] Mostly immature fish.
[2] Small red hake in scallop.

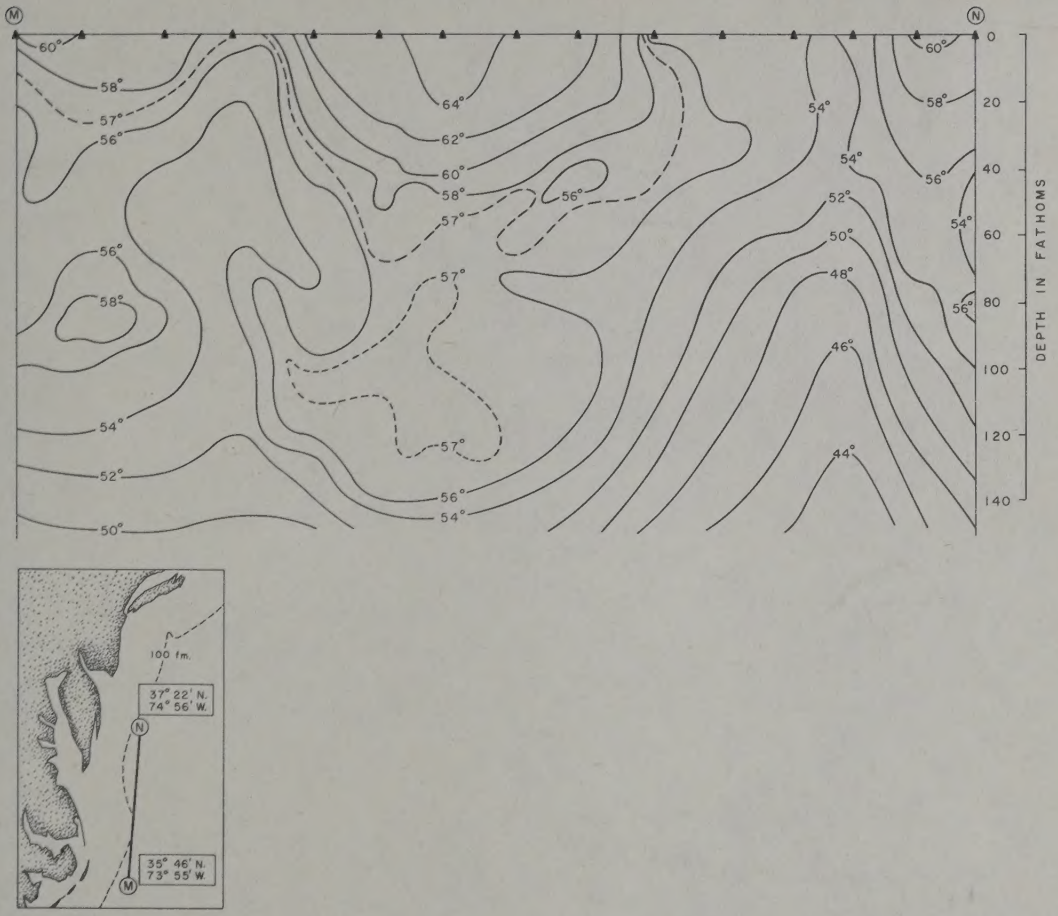

Figure A-18.--Temperature profile M-N. Data from bathythermograph casts 107 to 121, January 30-31, 1959.

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